

FLOOD INSURANCE STUDY



GUERNSEY COUNTY, OHIO AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
BYESVILLE, VILLAGE OF	390199
CAMBRIDGE, CITY OF	390200
CUMBERLAND, VILLAGE OF	390824
KIMBOLTON, VILLAGE OF	390201
LORE CITY, VILLAGE OF	390202
PLEASANT CITY, VILLAGE OF	390203
QUAKER CITY, VILLAGE OF	390853
SENECAVILLE, VILLAGE OF	390858
UNINCORPORATED AREAS	390198

FEBRUARY 17, 1989



Federal Emergency Management Agency

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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Flood Insurance Rate Map

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FLOOD INSURANCE STUDY

GUERNSEY COUNTY, OHIO AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the geographic area of Guernsey County, Ohio, including the Villages of Hyesville, Cumberland, Kimbolton, Lore City, Pleasant City, Quaker City, and Senecaville, the City of Cambridge, and the Unincorporated Areas of Guernsey County (hereinafter referred to collectively as Guernsey County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study revises and supersedes a previous Flood Insurance Study for the City of Cambridge, Ohio, and a Flood Insurance Rate Map for the Village of Pleasant City, Ohio (References 1 and 2). This information will be used by the community to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Woolpert Consultants (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-84-C-1616. This study was completed in January 1986.

1.3 Coordination

Streams requiring detailed study were identified at a meeting on April 5, 1984, attended by representatives of the community, the Ohio Department of Natural Resources (ODNR), the Disaster Services Administration (DSA), FEMA, and the Study Contractor.

Results of the hydrologic analyses were coordinated with the U.S. Geological Survey (USGS), the U.S. Army Corps of Engineers (COE), the ODNR, and the Soil Conservation Service (SCS).

On February 16, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of Guernsey County, Ohio. The area of study is shown on the Vicinity Map (Figure 1).

Flooding caused by overflow of Wills Creek, Hospital Tributary, Leatherwood Creek, Crooked Creek, Buffalo Fork, Collins Fork, and Smith Creek was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Maps for Guernsey County and the Village of Senecaville, Ohio (References 3 and 4) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through April 1989. The scope and methods of study were proposed to and agreed upon by FEMA and representatives of Guernsey County.

2.2 Community Description

Guernsey County is in east-central Ohio and is bordered on the west by Muskingum County, on the northwest by Coshocton County, on the north by Tuscarawas County, on the northeast by Harrison County, on the east by Belmont County, and on the south by Noble County. Guernsey County is approximately 74 miles east of Columbus and 100 miles south of Cleveland, the major metropolitan areas in this area of Ohio. The largest community in Guernsey County is the City of Cambridge, the county seat. Guernsey County is served by U.S. Routes 22 and 40, and Interstates 70 and 77. The 1980 population of Guernsey County was reported to be 41,836, an 11-percent increase from the 1970 population of 37,665. About one-third of the population lives within the City of Cambridge (Reference 5).

The terrain of the area ranges from nearly level in the stream floodplains to sloping and very steep in the uplands. The soils are somewhat poorly drained in the floodplains and well-drained to moderately well-drained in the uplands. These soils are underlain mostly by shale and sandstone with thin layers of limestone bedrock (Reference 6).

The land within Guernsey County is used mainly for forestry, mining, and agriculture. The area has deposits of coal, pottery clay, oil, and natural

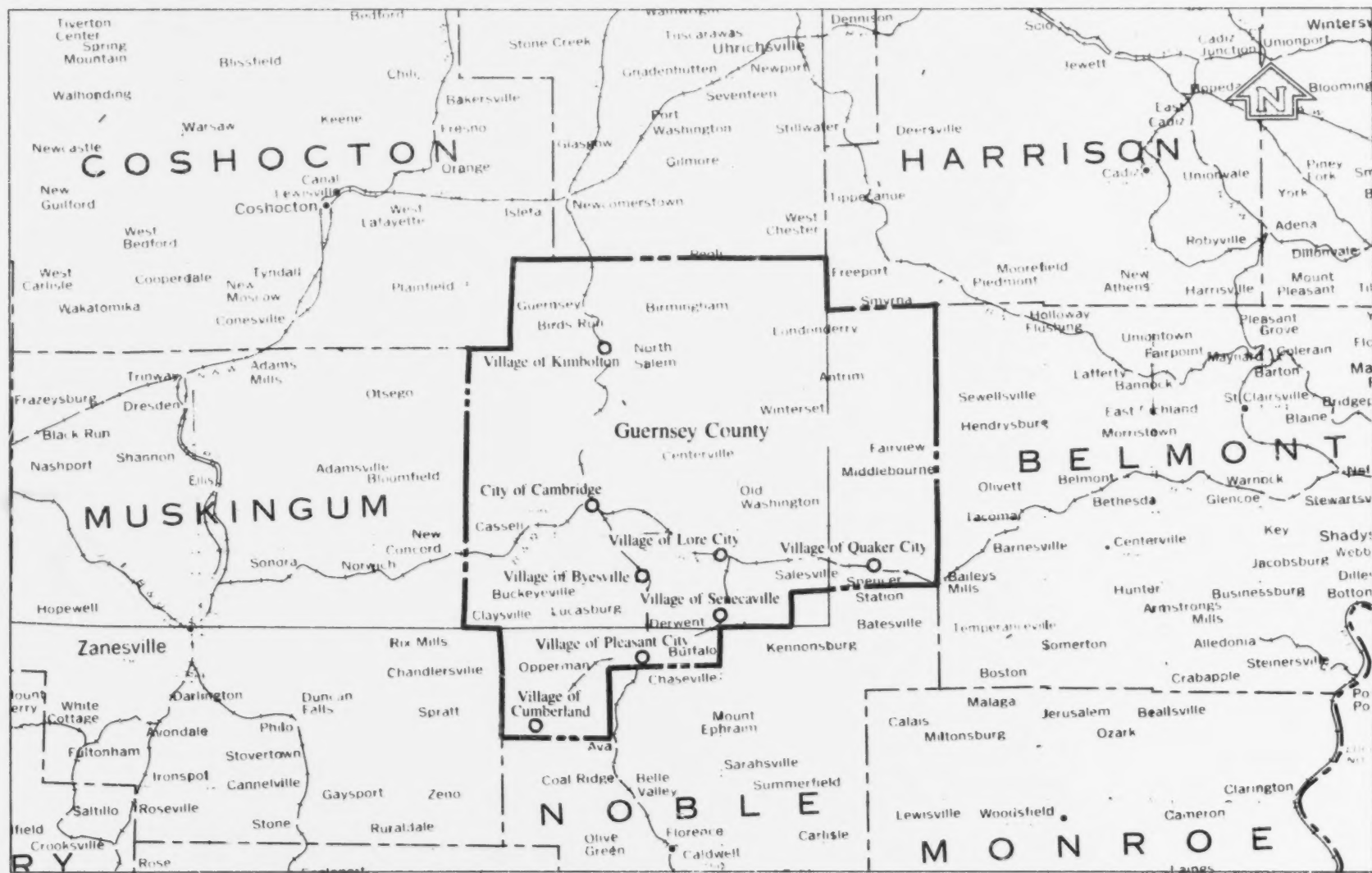


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

APPROXIMATE SCALE



VICINITY MAP

gas. Industries include strip-mining, manufacture of plastic, polymers, glass and glassware, furniture, wood articles, kitchen utensils, spark plugs, small motors, and metal alloys. The agricultural region produces corn, wheat, and oats (Reference 7).

The climate of Guernsey County is typical of the Central Temperate Zone, with frequent and rapid changes in weather due to alternate invasions of continental polar and maritime tropical air masses. Monthly mean temperatures range from a low of 29 degrees Fahrenheit (°F) in January, to a high of 75 °F in July; the average annual precipitation is 39 inches (Reference 8).

All streams studied in this study are within the Muskingum River basin. Wills Creek, which has a total drainage area of 353 square miles, flows in a northwesterly direction through the City of Cambridge to the Muskingum River and drains the major portion of Guernsey County. The average fall of the stream north of Cambridge is 0.8 foot per mile (Reference 7). Leatherwood Creek, a major tributary to Wills Creek with its confluence in Cambridge, flows in a westerly direction and drains the southeastern portion of Guernsey County. All other streams studied are tributaries to Wills Creek.

2.3 Principal Flood Problems

The principal flooding problem in Guernsey County is the periodic overflow of Wills Creek, Crooked Creek, Leatherwood Creek, Buffalo Creek, Collins Creek, and Smith Creek (see Figure 2).

The history of flooding along the streams in the county indicates that flooding could occur during any season of the year. The majority of the major floods have occurred during January to March and have usually been the result of spring rains and/or rapid snowmelt. The most significant floods for which records are available occurred in 1907, 1913, 1935, 1945, 1963, 1964, and 1980. Of these, the Wills Creek flood of August 8, 1935, produced the highest stage and caused the most damage. According to the data obtained from the COE gage at Cambridge, this flood had a peak discharge of 11,800 cubic feet per second (cfs) and an elevation of 797.7 feet National Geodetic Vertical Datum of 1929 (NGVD) (Reference 7).

In August 1980, a damaging flood occurred that affected four Ohio counties and resulted in a Presidential Disaster Declaration. While all of Guernsey County was affected, the areas hardest hit were Byesville, Cambridge, Lore City, and Quaker City. Based on high-water marks obtained by the USGS (Reference 9), the flood was estimated to have a frequency approximating a 50-year event. However, areas of Cambridge experienced elevations that approximated a 100-year flood because of constriction caused by several bridges within the city.

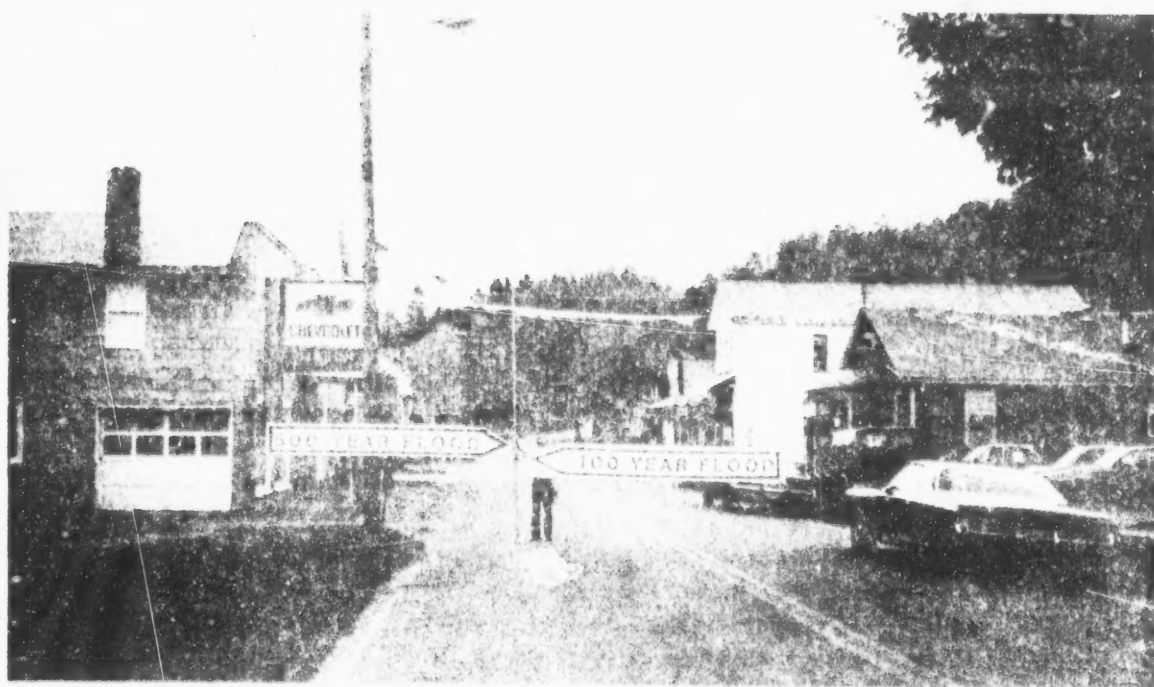
2.4 Flood Protection Measures

Floodflows on Seneca Fork are regulated by a dam operated and maintained by the COE. Seneca Lake, which is formed by the dam, controls a drainage area of 118 square miles and is used for flood control, recreation, and fish and wildlife enhancement. The dam closure was completed in September 1936 and the reservoir design peak flow is 9,100 cfs (Reference 10).

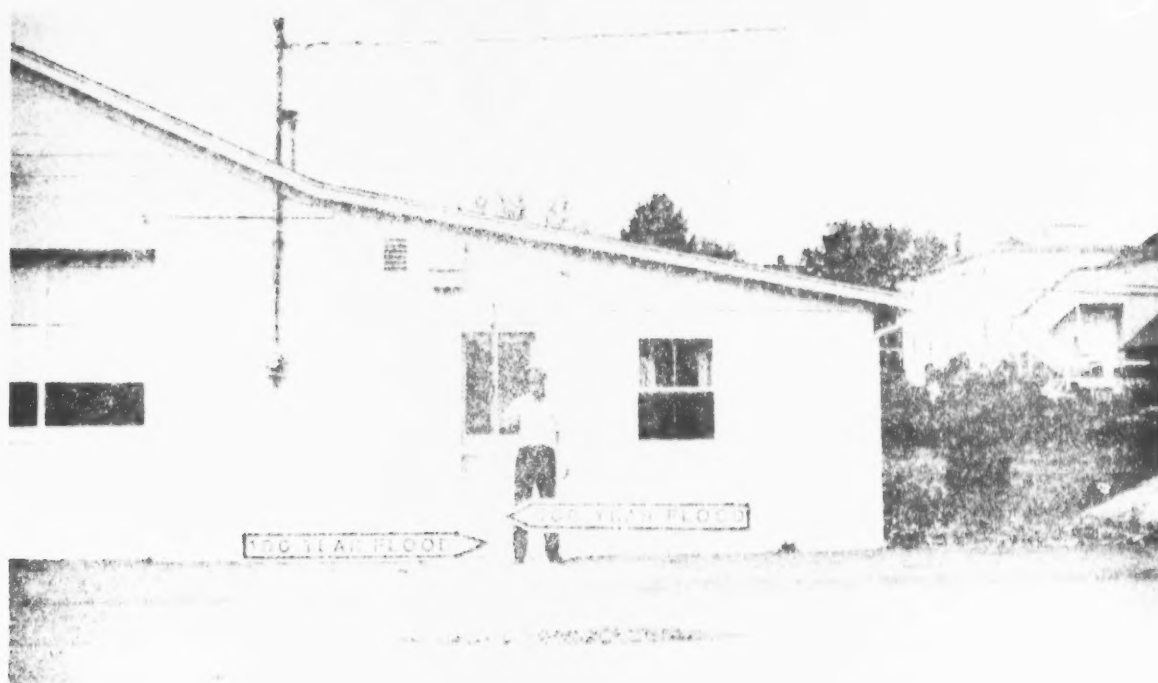
Figure 2 - 100- and 500-year Flood Heights



100- and 500-year flood heights of Leatherwood Creek at Village Hall on Fair Street.



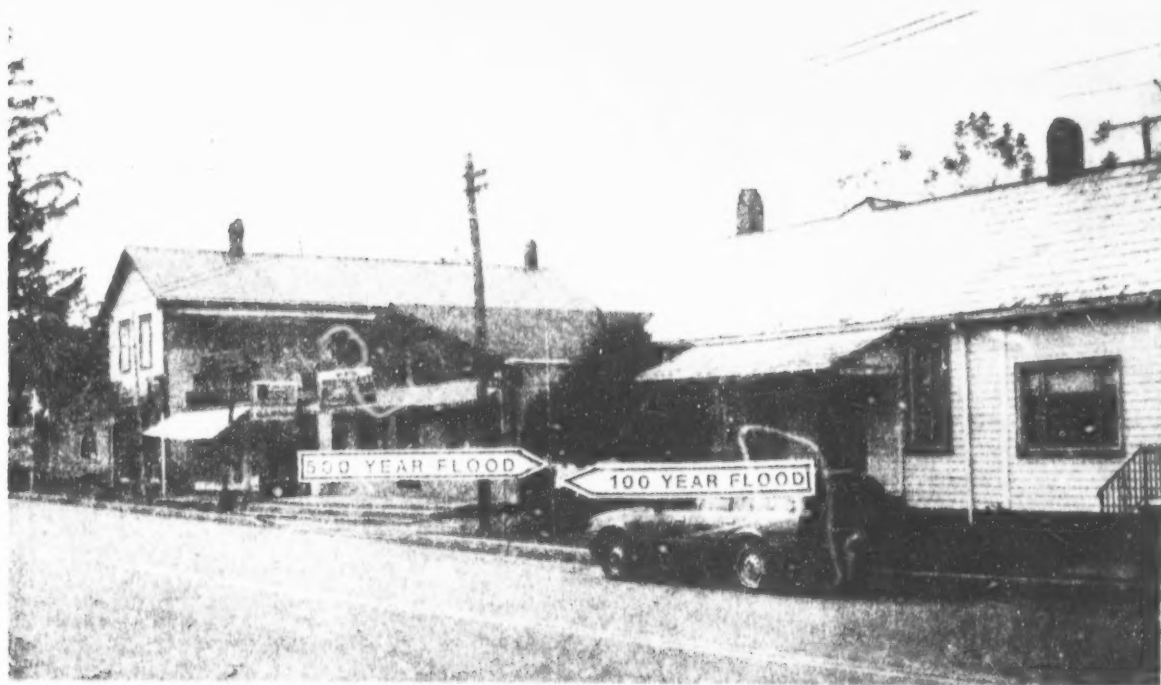
100- and 500-year flood heights of Leatherwood Creek looking north along Pike Street.



100- and 500-year flood heights at 4450 York at Cumberland Village, Ala., looking north.



100- and 500-year flood heights at 4450 York at Cumberland Village, Ala., looking north.



100- and 500-year flood heights of Leatherhead Creek on Main Street in Lore City just south of Leatherwood Creek.



100- and 500-year flood heights of Leatherwood Creek at the north corporate limits of Lore City on Main Street



100- and 500-year flood heights of Will Creek at the
County Road 43 Bridge near Byseville.

There are no other structural flood protection works that affect Guernsey County. Nonstructural measures for flood protection are in the form of state directives which require that all agencies comply with floodplain management criteria established by the Flood Disaster Protection Act of 1973.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Peak discharges for Wills Creek and Leatherwood Creek (to river mile 5.5) are based on COE gage records and reflect flow regulation by Senecaville Lake.

Crooked Creek, Hospital Tributary, Collins Fork, Buffalo Fork, and Leatherwood Creek (above river mile 20.6), all ungaged streams, were evaluated by the regression methods recommended for this region of Ohio by the ODNR (Reference 11). The mathematical model is based on data received from 46 gaging stations in the Ohio River drainage basin. Principal parameters include drainage areas, stream slopes, and mean annual precipitation.

Peak discharges for Wills Creek were computed by the COE based on guidelines in Bulletin No. 17A (Reference 12).

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (SQ MILES)</u>	<u>PEAK DISCHARGE (CFS)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
WILLS CREEK					
at Campbell Avenue	406	6,800	9,800	11,100	14,500
just upstream of confluence of Leatherwood Creek	314	6,400	9,400	10,600	14,050
HOSPITAL TRIBUTARY					
at mouth	2.7	582	1,040	1,270	1,960
LEATHERWOOD CREEK					
at mouth	91.8	5,200	7,800	8,900	11,900
at Wintergreen Lane	60.0	3,990	6,260	7,380	10,000
just downstream of confluence of Smith Creek	24.8	3,613	5,896	6,900	9,098
upstream of confluence of Smith Creek	21.7	3,252	5,194	6,060	7,909
CROOKED CREEK					
at mouth	61.8	3,680	5,610	6,550	8,800

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
BUFFALO FORK at Cambridge Street	28.66	3,060	5,230	6,340	9,300
COLLINS FORK at mouth	22.64	2,520	4,280	5,180	7,600
SMITH CREEK at mouth	3.1	742	978	1,103	1,419

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the backwater analyses were obtained from aerial photographs taken in April 1984 at a scale of 1:9600 (Reference 13). Additional floodplain cross sections, below-water sections, and bridge data were obtained from field surveys. In addition, cross sections were taken from field surveys obtained by the SCS.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Profiles for Wills Creek and the downstream portion of Leatherwood Creek were obtained from the SCS WSP-2 computer program (Reference 14).

Roughness coefficients (Manning's "n") for water-surface computations of Leatherwood Creek were determined using computer modeling of the backwater curves to match the high-water marks of the September 1980 flood in Quaker City (Reference 9). Roughness values ranged from 0.040 to 0.075 for the main channel and from 0.065 to 0.120 for the overbank areas. Field observations of the stream and floodplain areas and aerial photoanalysis were also used to ensure continuity.

For Buffalo Creek and Collins Creek, values averaged 0.075 for the main channel and 0.100 for the overbanks. Average values for Smith Creek were 0.050 for the channel and 0.060 for the overbanks. Field observation and aerial photoanalysis were also used to determine roughness coefficients for Hospital Tributary; values ranged from 0.045 to 0.090 for the main channel and from 0.045 to 0.055 for the overbank. For Wills Creek, values ranged from 0.035 to 0.040 for the main channel and from 0.050 to 0.060 for the overbanks. For Crooked Creek, values ranged from 0.060 to 0.075 for the main channel and from 0.080 to 0.120 for the overbanks (Reference 7).

Water-surface elevations for the floods of the selected recurrence intervals were computed using the HEC-2 step-backwater computer program (Reference 15). Starting water-surface elevations for the streams were based on slope-area computations.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the NGVD. Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4800 with contour intervals of 2 feet and 4 feet (References 16 and 17).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Maps for Guernsey County and the Village of Senecaville (References 3 and 4).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and the 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

A floodway has not been computed for the upper portion of Wills Creek. Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 3.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
WILLS CREEK								
A	100	582	12,103	1.0	794.4	794.4	795.4	1.0
B	998	923	15,727	0.8	794.5	794.5	795.5	1.0
C	3573	600	11,561	1.0	794.6	794.6	795.6	1.0
D	4852	755	12,870	0.9	794.7	794.7	795.7	1.0
E	5961	1272	18,696	0.6	794.7	794.7	795.7	1.0
F	6964	988	14,377	0.8	794.7	794.7	795.7	1.0
G	8020	511	7686	1.6	794.7	794.7	795.7	1.0
H	9023	300	5662	2.1	794.8	794.8	795.8	1.0
I	9868	120	3596	3.3	794.8	794.8	795.8	1.0
J	10,924	1086	16,064	0.1	795.2	795.2	796.2	1.0
K	11,822	1516	21,516	0.6	795.2	795.2	796.2	1.0
L	12,878	600	10,188	1.2	795.2	795.2	796.2	1.0
M	14,514	670	9896	1.2	795.4	795.4	796.4	1.0
N	16,732	793	11,863	1.0	795.5	795.5	796.5	1.0
O	18,633	706	10,772	1.0	795.6	795.6	796.6	1.0
P	21,431	679	8120	1.4	795.8	795.8	796.8	1.0
Q	22,435	882	10,762	1.0	795.9	795.9	796.9	1.0
R	23,174	875	10,528	1.0	795.9	795.9	796.9	1.0
S	24,652	413	6033	1.8	796.0	796.0	797.0	1.0
T	26,553	294	5356	2.1	796.1	796.1	797.1	1.0
U	27,873	276	5711	1.9	796.2	796.2	797.2	1.0
V	28,982	516	7741	1.4	796.3	796.3	797.3	1.0
W	30,038	347	6442	1.7	796.4	796.4	797.4	1.0
X	31,041	245	4575	2.4	796.6	796.6	797.6	1.0
Y	31,516	323	6638	1.7	797.1	797.1	798.1	1.0
Z	32,519	437	7145	1.6	797.9	797.9	798.9	1.0

¹FEET ABOVE LIMIT OF DETAILED STUDY (3575 FEET DOWNSTREAM FROM WILLS CREEK VALLEY ROAD)

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY GUERNSEY COUNTY, OH AND INCORPORATED AREAS	FLOODWAY DATA
		WILLS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
WILLS CREEK								
AA	33,602	216	5482	2.0	797.9	797.9	798.9	1.0
AB	33,738	154	4170	2.7	798.0	798.0	799.0	1.0
AC	34,869	360	7990	1.4	798.0	798.0	799.0	1.0
AD	35,687	272	6283	1.8	798.2	798.2	799.2	1.0
AE	35,832	193	4618	2.4	798.2	798.2	799.2	1.0
AF	36,770	230	5032	2.2	798.3	798.3	799.3	1.0
AG	37,720	297	5813	1.9	798.4	798.4	799.4	1.0
AH	37,862	191	5004	2.2	798.4	798.4	799.4	1.0
AI	38,492	197	4700	2.4	798.4	798.4	799.4	1.0
AJ	38,993	130	3352	3.3	798.5	798.5	799.5	1.0
AK	39,125	119	3037	3.7	799.0	799.0	800.0	1.0
AL	39,653	222	4893	2.3	799.1	799.1	800.1	1.0
AM	42,716	410	12,071	0.9	799.3	799.3	800.3	1.0
AN	42,857	542	11,274	1.0	799.7	799.7	800.7	1.0
AO	43,460	900	14,361	0.8	799.7	799.7	800.7	1.0
AP	43,575	977	21,284	0.5	799.8	799.8	800.8	1.0
AQ	44,675	1030	15,643	0.7	799.8	799.8	800.8	1.0
AR	45,361	1870	33,864	0.3	799.8	799.8	800.8	1.0
AS	46,470	2276	38,701	0.3	799.8	799.8	800.8	1.0
AT	49,268	780	11,029	1.0	799.8	799.8	800.8	1.0
AU	50,351	1026	17,575	0.6	799.9	799.9	800.9	1.0
AV	51,512	1478	21,944	0.5	799.9	799.9	800.9	1.0
AW	52,647	2333	33,091	0.3	799.9	799.9	800.9	1.0
AX	53,968	2359	33,759	0.3	799.9	799.9	800.9	1.0

¹FEET ABOVE LIMIT OF DETAILED STUDY (35/5 FEET DOWNSTREAM FROM WILLS CREEK VALLEY ROAD)

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

FLOODWAY DATA

WILLS CREEK

14

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
LEATHERWOOD CREEK								
A	0.120	200	3974	2.2	799.8	799.4 ²	800.2	0.8
B	0.390	945	12,850	0.7	799.8	799.6 ²	800.4	0.8
C	0.550	475	7068	1.3	799.8	799.6 ²	800.4	0.8
D	0.740	147	2748	3.2	799.8	799.6 ²	800.4	0.8
E	0.980	500	9468	0.9	800.8	800.8	801.8	1.0
F	1.170	536	9842	0.9	800.8	800.8	801.8	1.0
G	1.320	475	5890	1.5	800.9	800.9	801.9	1.0
H	1.520	541	9443	0.9	800.9	800.9	801.9	1.0
I	1.880	1240	21,604	0.4	800.9	800.9	801.9	1.0
J	2.310	1143	18,701	0.5	800.9	800.9	801.9	1.0
K	2.640	1055	16,757	0.5	801.2	801.2	802.1	0.9
L	3.778	1879	27,919	0.3	801.6	801.6	802.6	1.0
M	4.214	1738	24,692	0.4	801.6	801.6	802.6	1.0
N	4.470	1619	20,202	0.4	801.6	801.6	802.6	1.0
O	4.715	1194	14,369	0.6	801.7	801.7	802.7	1.0
P	4.940	1805	19,251	0.5	801.7	801.7	802.7	1.0
Q	10.760	974	2829	2.6	813.4	813.4	814.4	1.0
R	10.860	59	655	11.3	814.5	814.5	815.4	0.9
S	11.120	188	1683	4.4	819.7	819.7	820.3	0.6
T	11.440	1216	8347	0.8	820.2	820.2	820.8	0.6
U	11.630	1354	8655	0.9	820.2	820.2	820.9	0.7
V	11.799	1254	7771	0.9	820.3	820.3	821.1	0.8
W	11.880	1111	1875	1.5	820.5	820.5	821.3	0.8
X	20.623	511	3076	2.3	861.5	861.5	862.5	1.0
Y	20.732	455	3430	2.1	862.4	862.4	863.1	0.7
Z	21.118	537	4747	1.4	863.7	863.7	864.5	0.8

¹MILES ABOVE MOUTH

²ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM WILLS CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

FLOODWAY DATA

LEATHERWOOD CREEK

15

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
LEATHERWOOD CREEK								
AA	21.355	290	1971	3.2	864.6	864.6	865.4	0.8
AB	21.418	180	1331	4.8	867.0	867.0	867.3	0.3
AC	21.509	222	2063	3.1	867.6	867.6	868.1	0.5
AD	21.621	421	3442	2.0	867.7	867.7	868.6	0.9
AE	21.708	518	4181	1.7	867.8	867.8	868.8	1.0
AF	21.854	660	5312	1.3	868.0	868.0	869.0	1.0
AG	21.992	885	4787	1.4	868.2	868.2	869.1	0.9
AH	22.063	702	3717	1.9	869.0	869.0	870.0	1.0
AI	22.217	355	2950	2.1	872.8	872.8	873.8	1.0
AJ	22.460	915	6296	1.0	873.9	873.9	874.6	0.7
AK	22.676	544	4477	1.4	874.5	874.5	875.1	0.6
SMITH CREEK								
A	568 ²	93	483	2.3	869.5	865.6 ³	866.4	0.8
B	1018 ²	35	190	5.8	870.0	866.2 ³	866.8	0.6
C	1333 ²	32	153	7.2	870.0	867.7 ³	868.6	0.9
D	1633 ²	25	200	5.5	870.0	869.7 ³	870.7	1.0
E	1847 ²	265	870	1.3	871.0	871.0	871.8	0.8
F	2387 ²	44	206	5.3	871.2	871.2	871.9	0.7
G	2827 ²	111	373	3.0	872.5	872.5	873.5	1.0
H	3417 ²	80	286	3.9	873.9	873.9	874.9	1.0

¹MILES ABOVE MOUTH

²FEET ABOVE MOUTH

³ELEVATIONS WITHOUT CONSIDERING OVERFLOW EFFECT FROM LEATHERWOOD CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

FLOODWAY DATA

LEATHERWOOD CREEK—SMITH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
CROOKED CREEK								
A	2200	290	3634	1.8	795.5	791.1 ²	792.1	1.0
B	6730	383	5322	1.2	795.5	792.1 ²	793.1	1.0
C	8980	226	2907	2.3	795.5	792.7 ²	793.7	1.0
D	11,510	224	3200	2.0	795.5	793.6 ²	794.6	1.0
E	14,228	264	3907	1.7	795.8	793.6 ²	794.6	1.0
F	18,438	349	4378	1.5	795.8	795.8	796.7	0.9
G	30,031	300	4211	1.6	800.8	800.8	801.1	0.4
H	34,858	313	4435	1.5	802.8	802.8	803.8	1.0
HOSPITAL TRIBUTARY								
A	2240	119	362	3.5	790.0	778.1 ²	778.8	0.7
B	3665	42	256	5.0	790.0	780.6 ²	781.4	0.8
C	4955	95	532	2.4	790.0	785.9 ²	786.3	0.4
D	5585	200	806	1.6	790.0	786.2 ²	786.7	0.5
E	6485	51	254	5.0	790.0	786.5 ²	787.2	0.7
F	7085	46	209	6.1	790.0	789.1 ²	789.7	0.6
G	7355	54	265	4.8	790.1	790.1	791.0	0.9
H	8395	54	327	3.9	793.6	793.6	794.4	0.8
I	8885	127	430	3.0	794.6	794.6	795.5	0.9
J	9345	113	521	2.4	795.3	795.3	796.2	0.9
K	9895	109	201	6.3	796.6	796.6	797.4	0.8

¹FEET ABOVE MOUTH

²ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM WILLS CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

FLOODWAY DATA

CROOKED CREEK—HOSPITAL TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BUFFALO FORK								
A	7.027	1114	4062	1.6	827.0	827.0	828.0	1.0
B	7.254	957	3472	1.9	828.4	828.4	829.4	1.0
C	7.567	979	4392	1.5	830.0	830.0	831.0	1.0
D	7.663	708	3355	1.9	830.8	830.8	831.7	0.9
E	7.896	992	3855	1.6	832.5	832.5	833.5	1.0
F	7.979	1441	6987	0.9	834.0	834.0	835.0	1.0
COLLINS FORK								
G	8.140	1329	5960	1.1	834.3	834.3	835.3	1.0
H	8.323	686	4349	1.2	835.9	835.9	836.9	1.0
I	8.467	628	3507	1.5	836.5	836.5	837.4	0.9

¹MILES ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

FLOODWAY DATA

BUFFALO FORK—COLLINS FORK

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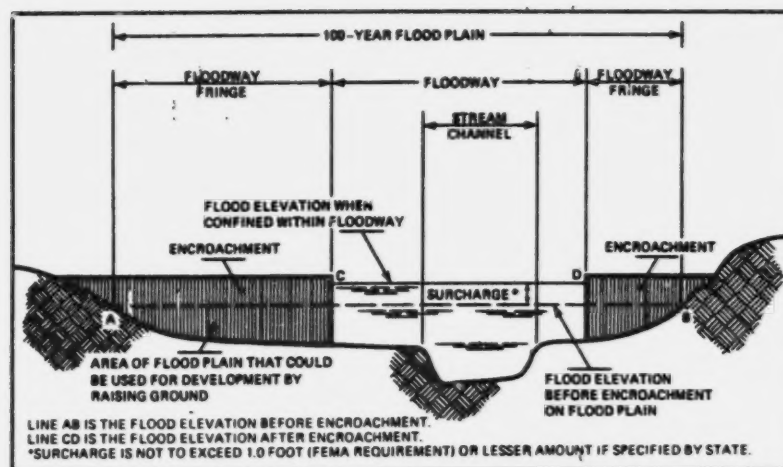


FIGURE 3 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current Flood Insurance Rate Map presents flooding information for the geographic area of Guernsey County. Previously, separate Flood Hazard Boundary Maps and/or Flood Insurance Rate Maps were prepared for each flood-prone incorporated community and the unincorporated areas of the county. Historical data relating to the maps prepared for each community are presented in Table 3, Community Map History.

7.0 OTHER STUDIES

The elevations for Leatherwood Creek in the SCS report for the Village of Quaker City, Ohio, titled "Watershed Plan and Environmental Assessment for Wills Creek Watershed, Ohio" (Reference 18) are superseded by the elevations shown in this study.

Flood Insurance Studies published for Tuscarawas and Coshocton Counties, Ohio (References 19 and 20) are in agreement with this study.

A Flood Insurance Study in progress for Muskingham County, Ohio (Reference 21) is in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Maps for the Villages of Senecaville, Byesville, Cumberland, Lore City, and Quaker City, Ohio (References 4 and 22-25) and Guernsey County, Ohio (Reference 3); the Flood Insurance Study for the City of Cambridge, Ohio (Reference 1); and the Flood Insurance Rate Map for the Village of Pleasant City, Ohio (Reference 2).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
BYESVILLE, VILLAGE OF	MARCH 29, 1974	MAY 21, 1976	FEBRUARY 17, 1989	
CAMBRIDGE, CITY OF	MAY 31, 1974	NOVEMBER 21, 1975	MARCH 18, 1986	
CUMBERLAND, VILLAGE OF	SEPTEMBER 15, 1978		FEBRUARY 17, 1989	
KIMBOLTON, VILLAGE OF			FEBRUARY 17, 1989	
LORE CITY, VILLAGE OF	JULY 2, 1976		FEBRUARY 17, 1989	
PLEASANT CITY, VILLAGE OF	JANUARY 5, 1979		JANUARY 5, 1979	
QUAKER CITY, VILLAGE OF	SEPTEMBER 29, 1978	OCTOBER 2, 1981	FEBRUARY 17, 1989	
SENECAVILLE, VILLAGE OF	OCTOBER 6, 1978		FEBRUARY 17, 1989	
UNINCORPORATED AREAS	MARCH 21, 1975	DECEMBER 16, 1977	FEBRUARY 17, 1989	

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

COMMUNITY MAP HISTORY

9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Study, City of Cambridge, Guernsey County, Ohio, March 1986.
2. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Rate Map, Village of Pleasant City, Guernsey County, Ohio, January 1979.
3. ———, Federal Insurance Administration Flood Hazard Boundary Map, Guernsey County, Unincorporated Areas, Ohio, December 1977.
4. ———, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Senecaville, Guernsey County, Ohio, October 1978.
5. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Ohio, Washington, D.C., February 1982.
6. Ohio Department of Natural Resources, Division of Lands and Soil, A General Soil Map of Guernsey County, 1973.
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8. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Services, Climatological Data for Ohio, Asheville, North Carolina, 1978.
9. U.S. Geological Survey, Unpublished Highwater Marks of the September 1980 Flood in Quaker City, Ohio.
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18. U.S. Department of Agriculture, Soil Conservation Service, Watershed Plan and Environmental Assessment for Wills Creek Watershed, Ohio, 1986.
19. Federal Emergency Management Agency, Flood Insurance Study, Tuscarawas County, Unincorporated Areas, Ohio, September 1987.
20. ———, Flood Insurance Study, Coshocton County, Unincorporated Areas, Ohio, February 1987.
21. Federal Emergency Management Agency, Flood Insurance Study, Muskingham County, Unincorporated Areas, Ohio, in progress.
22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Byesville, Guernsey County, Ohio, May 1976.
23. ———, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Cumberland, Guernsey County, Ohio, September 1978.
24. ———, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Lore City, Guernsey County, Ohio, July 1976.
25. Federal Emergency Management Agency, Flood Hazard Boundary Map, Village of Quaker City, Guernsey County, Ohio, October 1981.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0082	797.779	chiseled square on top of concrete headwall located at southeast corner of intersection of Old Twenty-One and Lee Lane
2	0082	790.107	COE disk stamped "811/9" in top of abutment at northwest corner of Old Twenty-One bridge over Hospital Tributary
3	0084	792.064	spike in powerpole located at northwest corner of intersection of Old Twenty-One and Eckleberry Road
4	0084	794.397	chiseled cross in top of "I"-beam at southeast corner of Eckleberry Road bridge over Hospital Tributary
5	0084	787.847	COE disk stamped "813/23" set in top of southwest abutment of Pigeon Gap Road bridge over Crooked Creek
6	0091	799.671	COE disk stamped "813/25" set in top of northwest abutment of Bloomfield Road bridge over Crooked Creek
7	0091	808.132	U.S. Coast & Geodetic Survey standard brass disk stamped "2-182" set vertically in east face of Ohio Department of Highways building, located about 1,700 feet southwest of Intersection of Phillips Road and Glenn Highway
8	0091	831.137	chiseled square in top of southeast abutment of Interstate 70 ramp bridge over Crooked Creek
9	0092	799.087	chiseled square in top of southwest stone abutment of Phillips Road bridge over Crooked Creek

ELEVATION REFERENCE MARKS

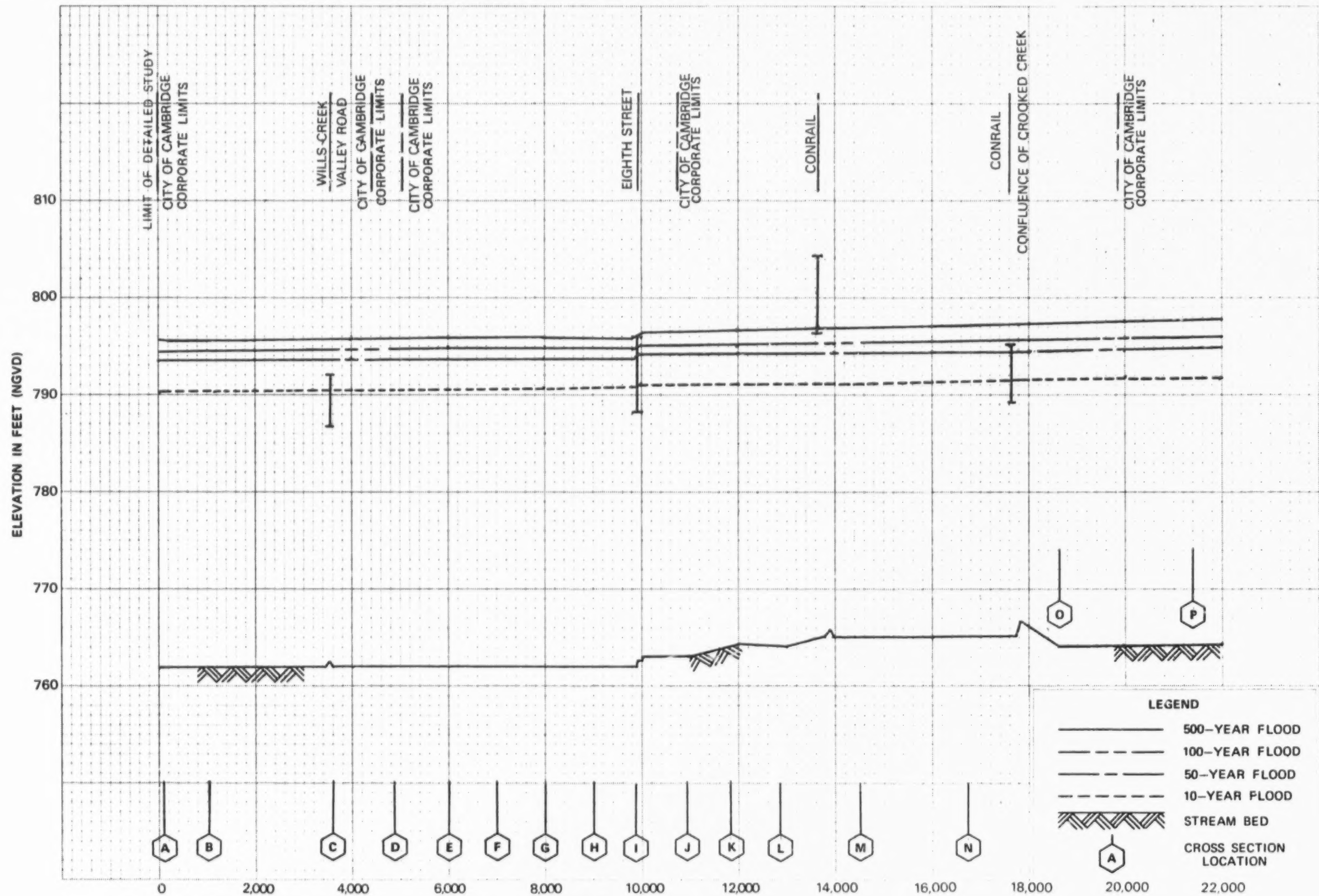
REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
10	0111	804.986	spike in powerpole located in northeast corner of intersection of CSX railroad and northbound Interstate 77
11	0111	804.639	spike in telephone pole no. 246 located at southwest corner of intersection of East Pike and Corduroy Road
12	0111	797.614	northwest corner "I"-beam at northwest corner abutment of Corduroy Road bridge over Leatherwood Creek
13	0111	803.310	nail in railroad crossing located at southeast corner of intersection of CSX railroad and Corduroy Road
14	0111	803.780	chiseled square on top of stone abutment at southwest corner of CSX railroad bridge over Leatherwood Creek
15	0111	805.509	chiseled square on top of abutment at southeast corner of East Pike bridge over Leatherwood Creek Tributary
16	0094	793.933	chiseled cross in top bolt set in cap board at northwest corner of Conrail bridge over Chapman Run
17	0094	793.974	spike in telephone pole located at northeast side of intersection of Church Road and Southgate Road
18	0113	796.550	chiseled square on top of abutment at northwest corner of County Route 347 bridge over Wills Creek
19	0113	795.803	spike in powerpole located on west side of Vocational Road at Kilborn Lane

ELEVATION REFERENCE MARKS

<u>REFERENCE MARK</u>	<u>FLOOD INSURANCE RATE MAP PANEL</u>	<u>ELEVATION (FEET NGVD)</u>	<u>DESCRIPTION OF LOCATION</u>
20	0113	803.743	spike in powerpole located at northwest corner of intersection of Southgate Road and CSX railroad
21	0113	805.35	chiseled cross on wingwall at northwest corner of concrete culvert located in northeast corner of intersection of Junction Street and Conrail
22	0113	797.227	chiseled square on top of abutment at northeast corner of North 10th Street bridge over Wills Creek
23	0113	806.944	chiseled square on top of concrete base of signpost located at southwest corner of intersection of Conrail and Main Street
24	0113	803.932	chiseled square on southeast abutment of Main Street bridge over Wills Creek
25	0113	806.448	chiseled cross on bolt in concrete base of lamppole located at northwest corner of intersection of Vocational Road and Main Street
26	0164	839.023	chiseled square on top of abutment at northeast corner of Renrock Road bridge over Collins Fork
27	0168	833.145	chiseled square on top of abutment at northeast corner of Cambridge Street bridge over Buffalo Fork
28	0168	832.458	chiseled square on top of southeast stone abutment of Perry's Den Road bridge over Buffalo Fork
29	0118	819.473	USGS disk stamped "4FK 1959" set in northwest concrete abutment of Main Street over Infirmary Run

ELEVATION REFERENCE MARKS

<u>REFERENCE MARK</u>	<u>FLOOD INSURANCE RATE MAP PANEL</u>	<u>ELEVATION (FEET NGVD)</u>	<u>DESCRIPTION OF LOCATION</u>
30	0118	849.444	spike in lightpole located at northeast corner of intersection of Main Street and East Street
31	0139	859.708	chiseled square in southwest abutment of Leatherwood Road bridge over tributary to Leatherwood Creek, about 530 feet east of Ironhorse Lane
32	0139	864.204	chiseled cross on top of guardrail located at northwest abutment of Yoker Valley Road bridge over Leatherwood Creek
33	0139	869.224	chiseled square on northwest abutment of CSX railroad bridge over Leatherwood Creek
34	0139	865.789	chiseled square in northwest abutment of Leatherwood Road bridge over tributary to Leatherwood Creek
35	0139	868.755	chiseled square in concrete walk at northwest corner of intersection of Main Street and Pike Street
36	0139	866.753	chiseled square in northeast abutment of Pike Street bridge over Leatherwood Creek
37	0143	865.975	chiseled square at northeast abutment of South Street bridge over Smith Creek
38	0143	872.056	chiseled square in northwest abutment of Barnsville Street bridge over Smith Creek



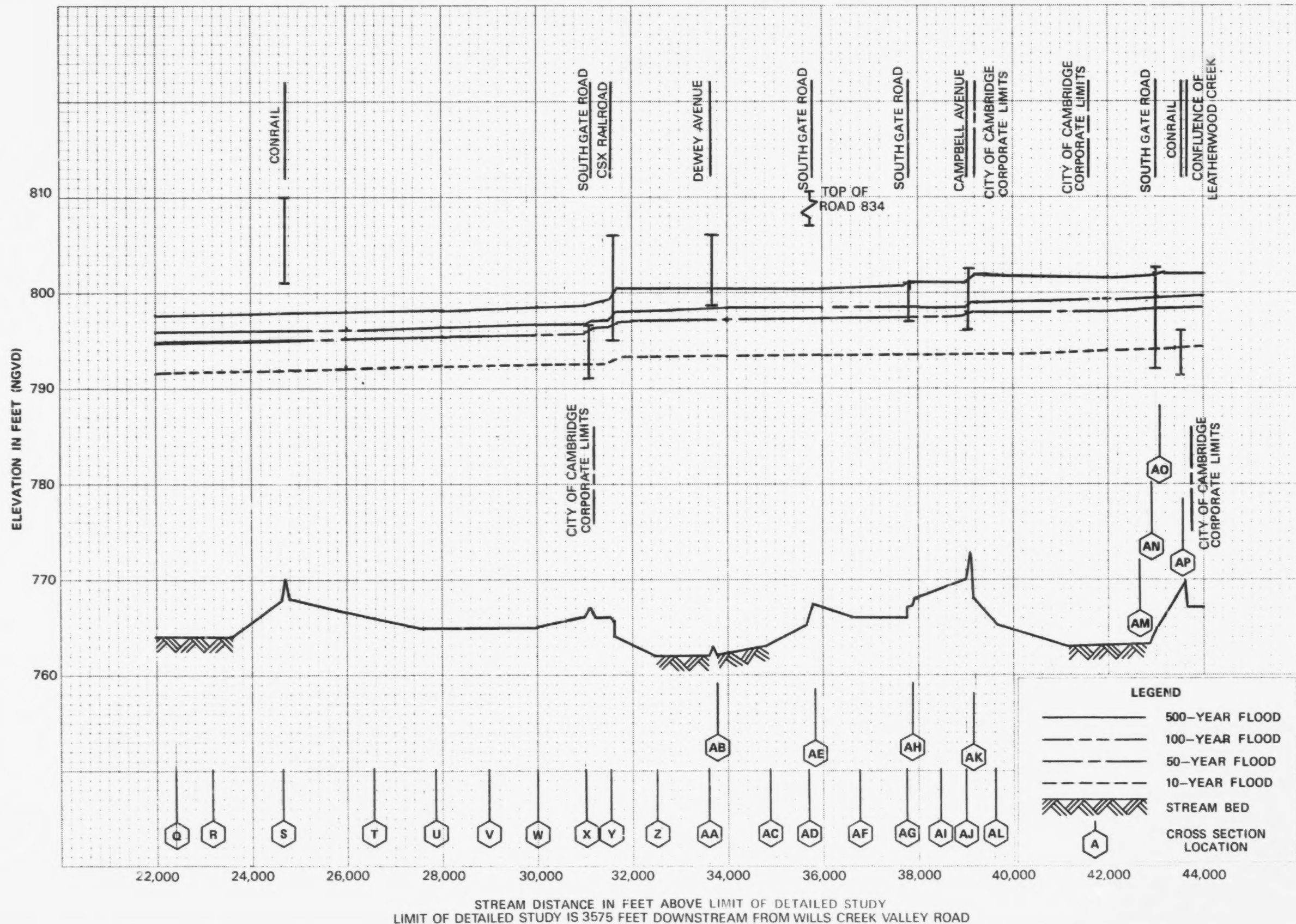
FLOOD PROFILES

WILLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GUERNSEY COUNTY, OH
AND INCORPORATED AREAS**

01P



FLOOD PROFILES

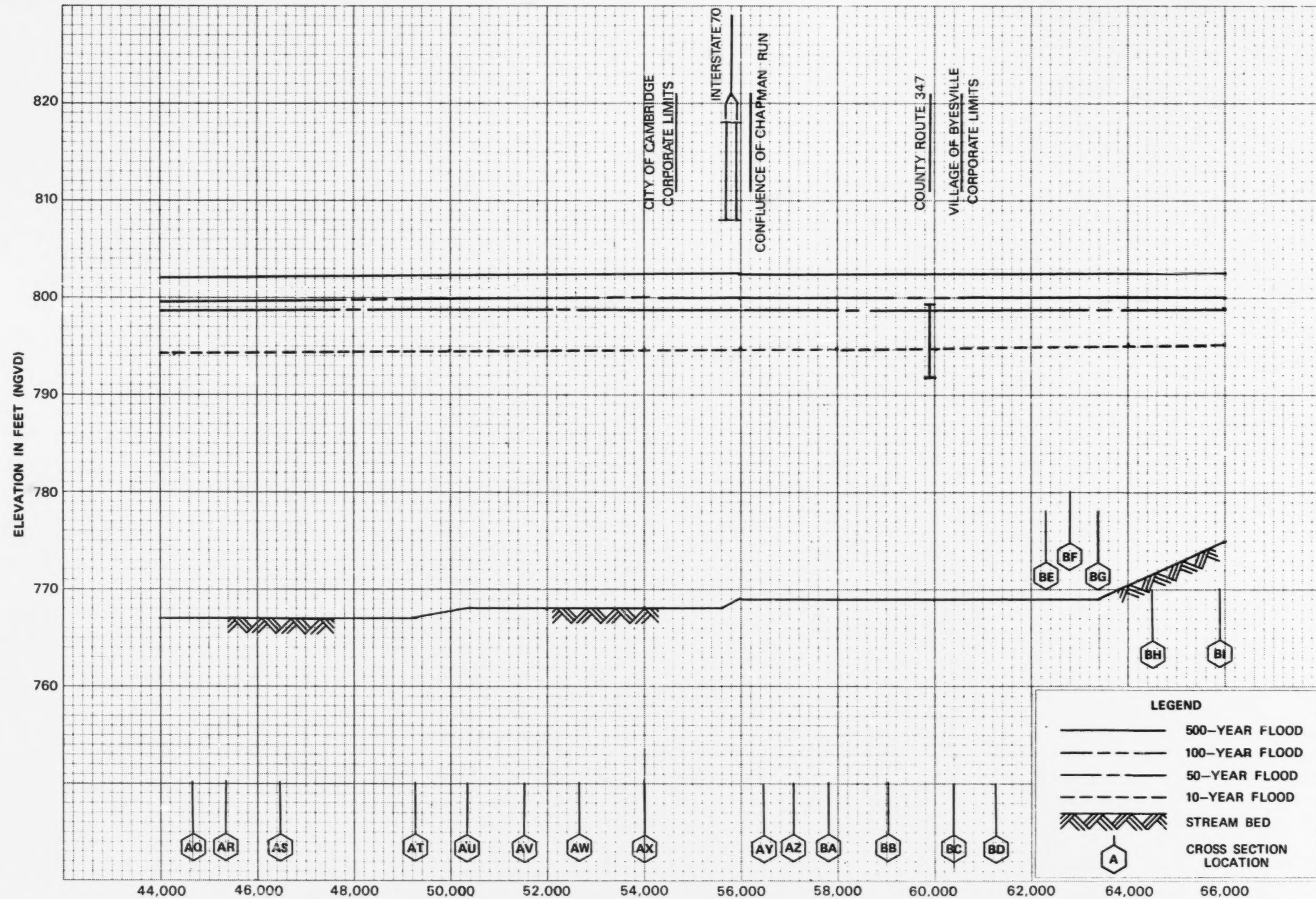
WILLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

02P

29



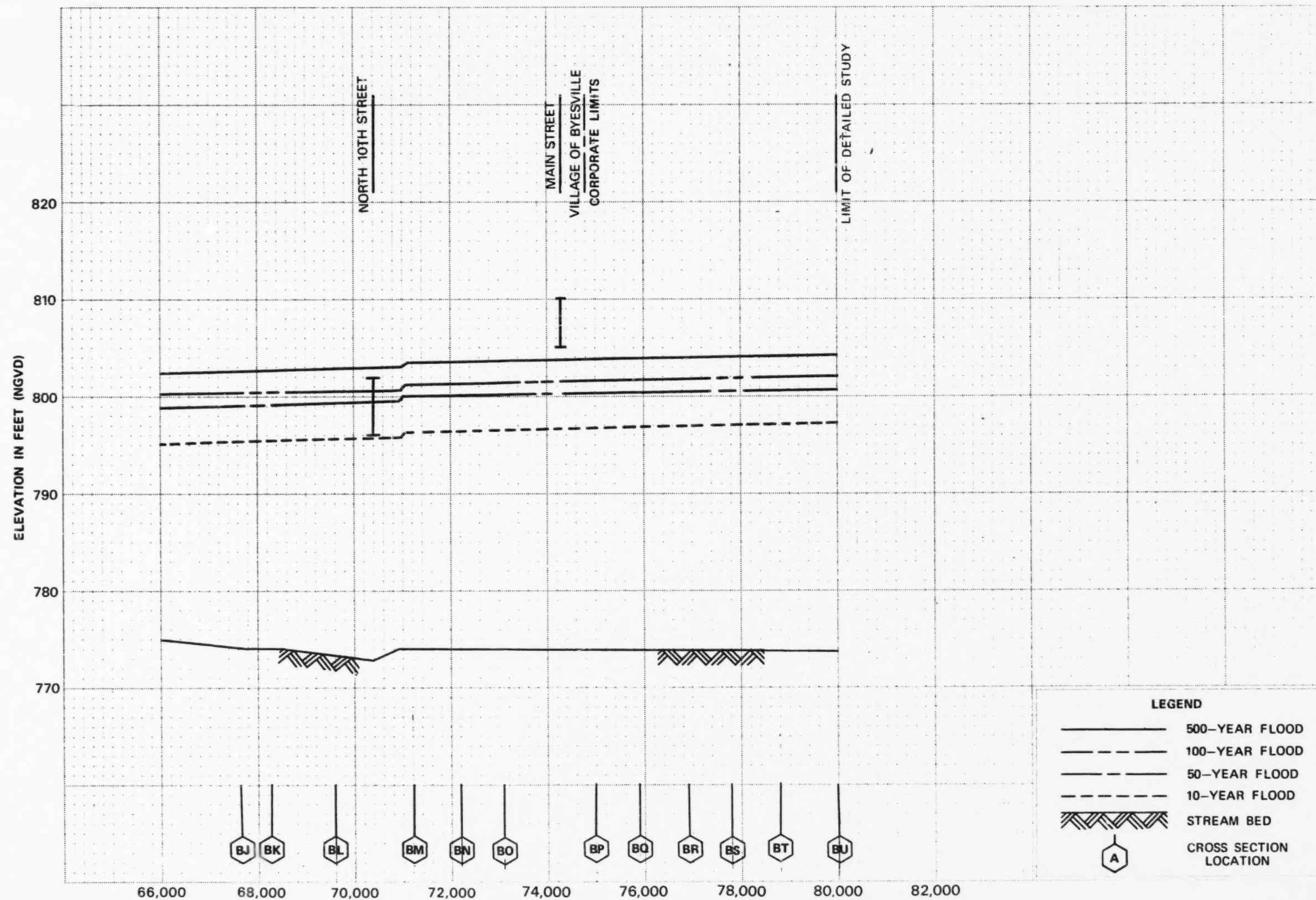
FLOOD PROFILES

WILLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
 GUERNSEY COUNTY, OH
 AND INCORPORATED AREAS

03P

30



STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY
LIMIT OF DETAILED STUDY IS 3575 FEET DOWNSTREAM OF WILLCREEK VALLEY ROAD

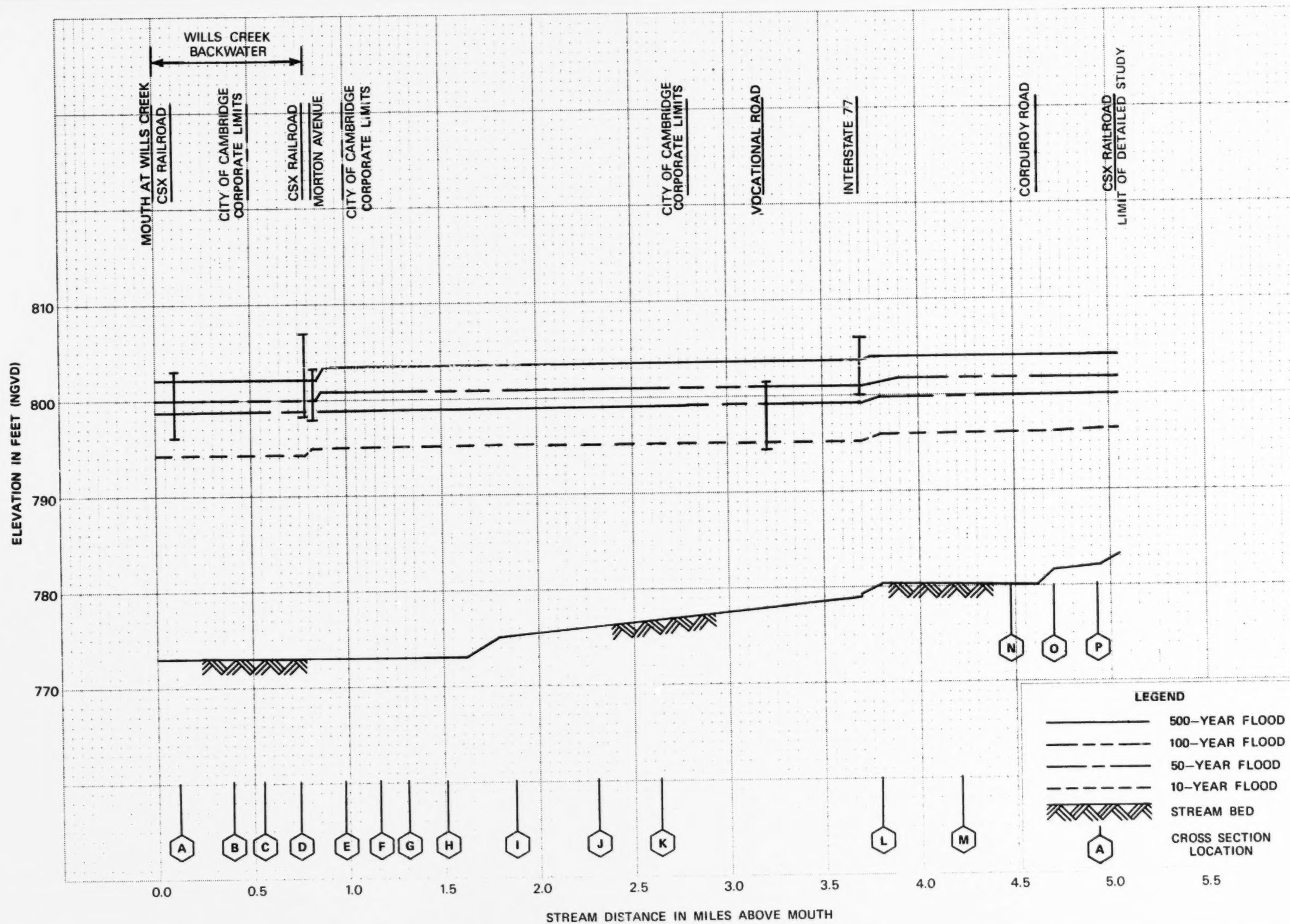
FLOOD PROFILES

WILLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

04P



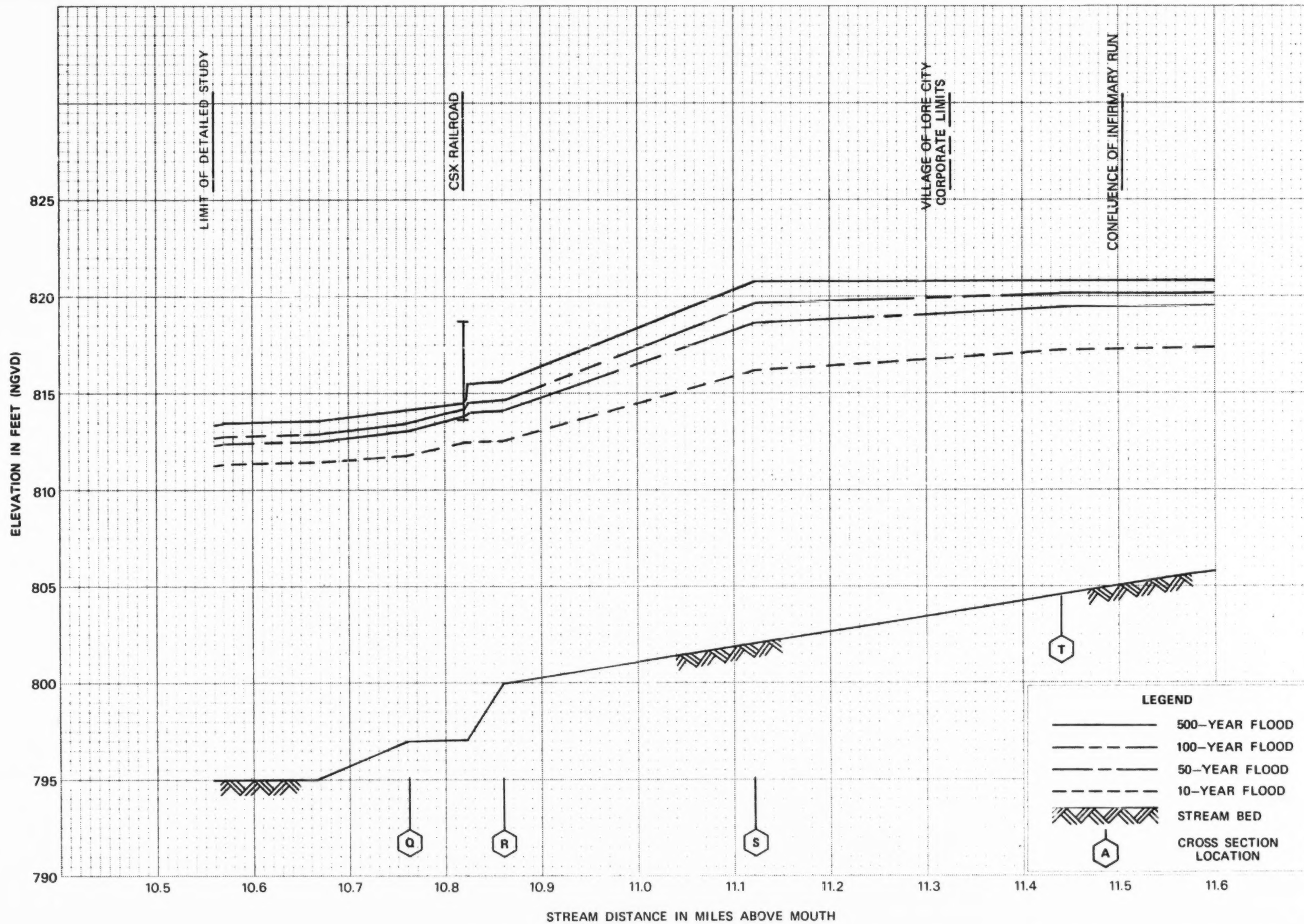
FLOOD PROFILES

LEATHERWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

05P



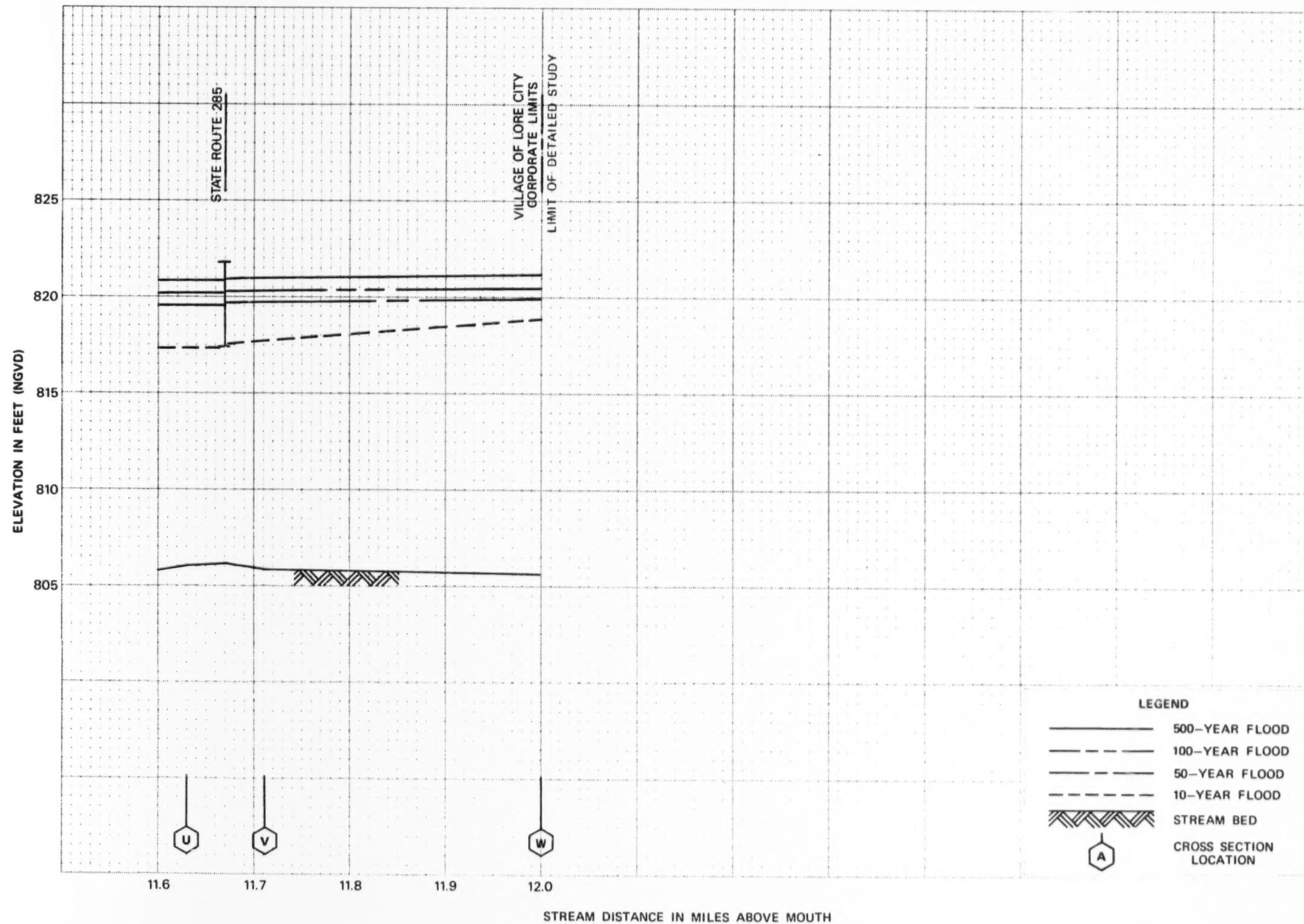
FLOOD PROFILES

LEATHERWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

06P



FLOOD PROFILES

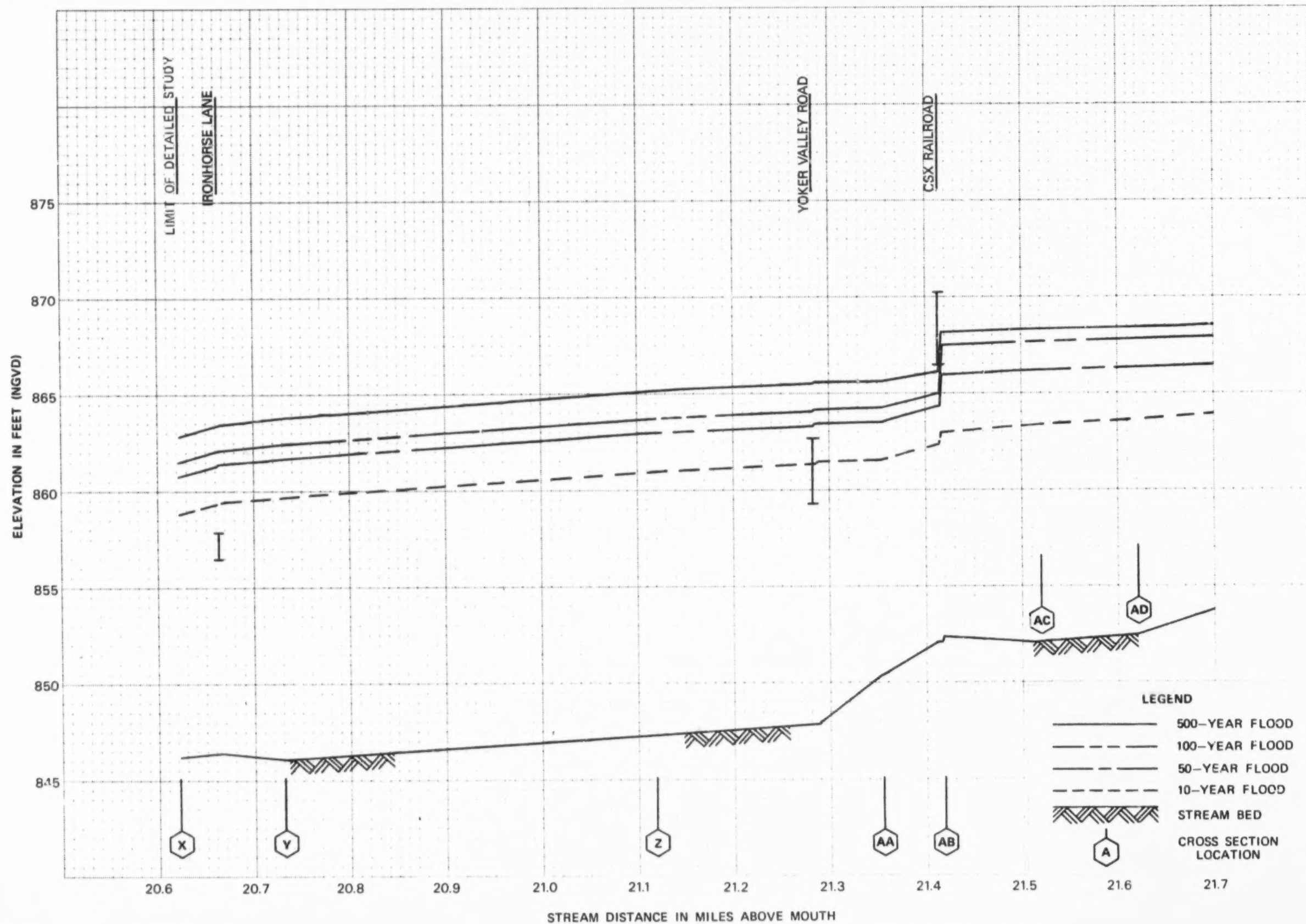
LEATHERWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

07P

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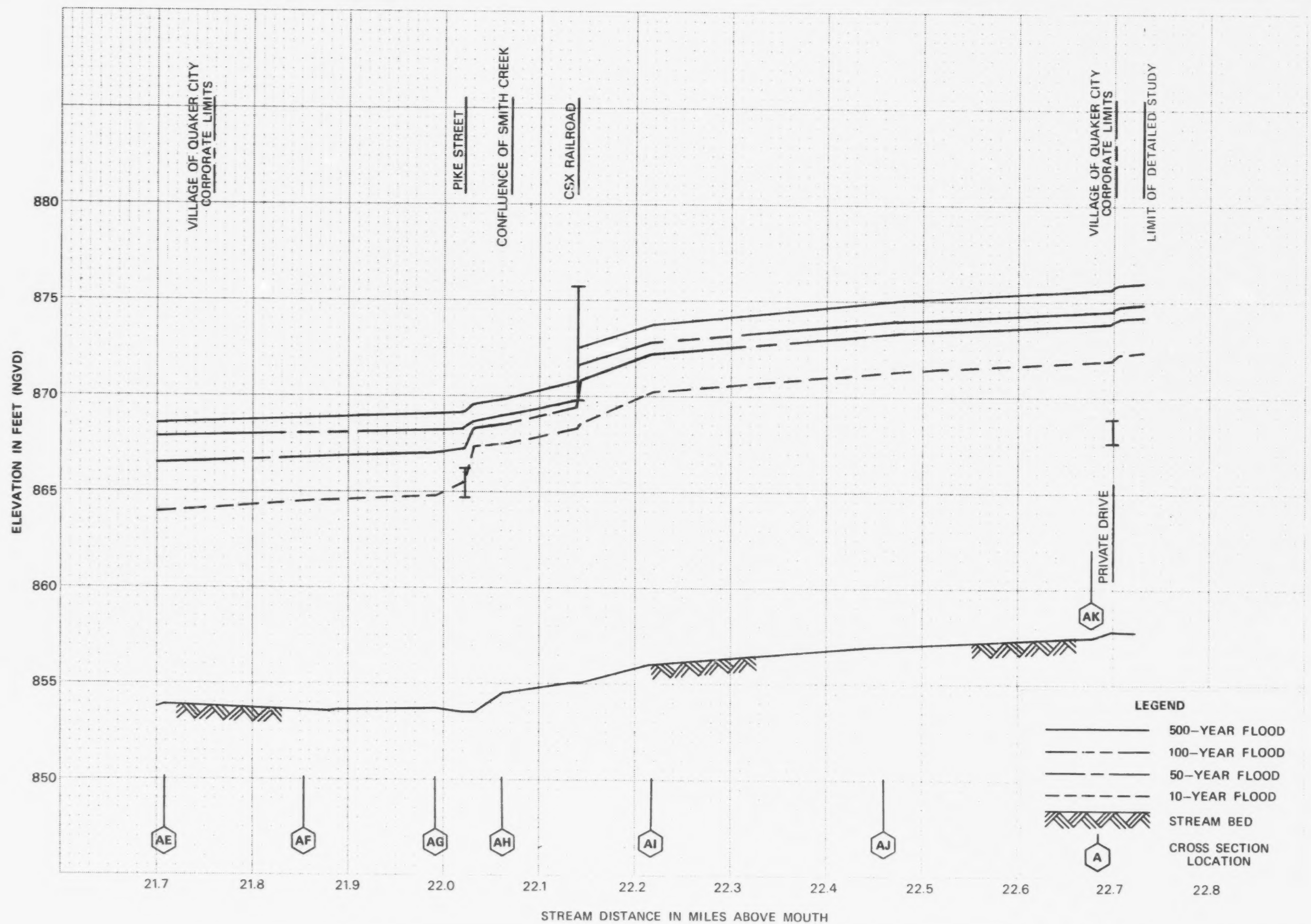
FLOOD PROFILES

LEATHERWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

08P



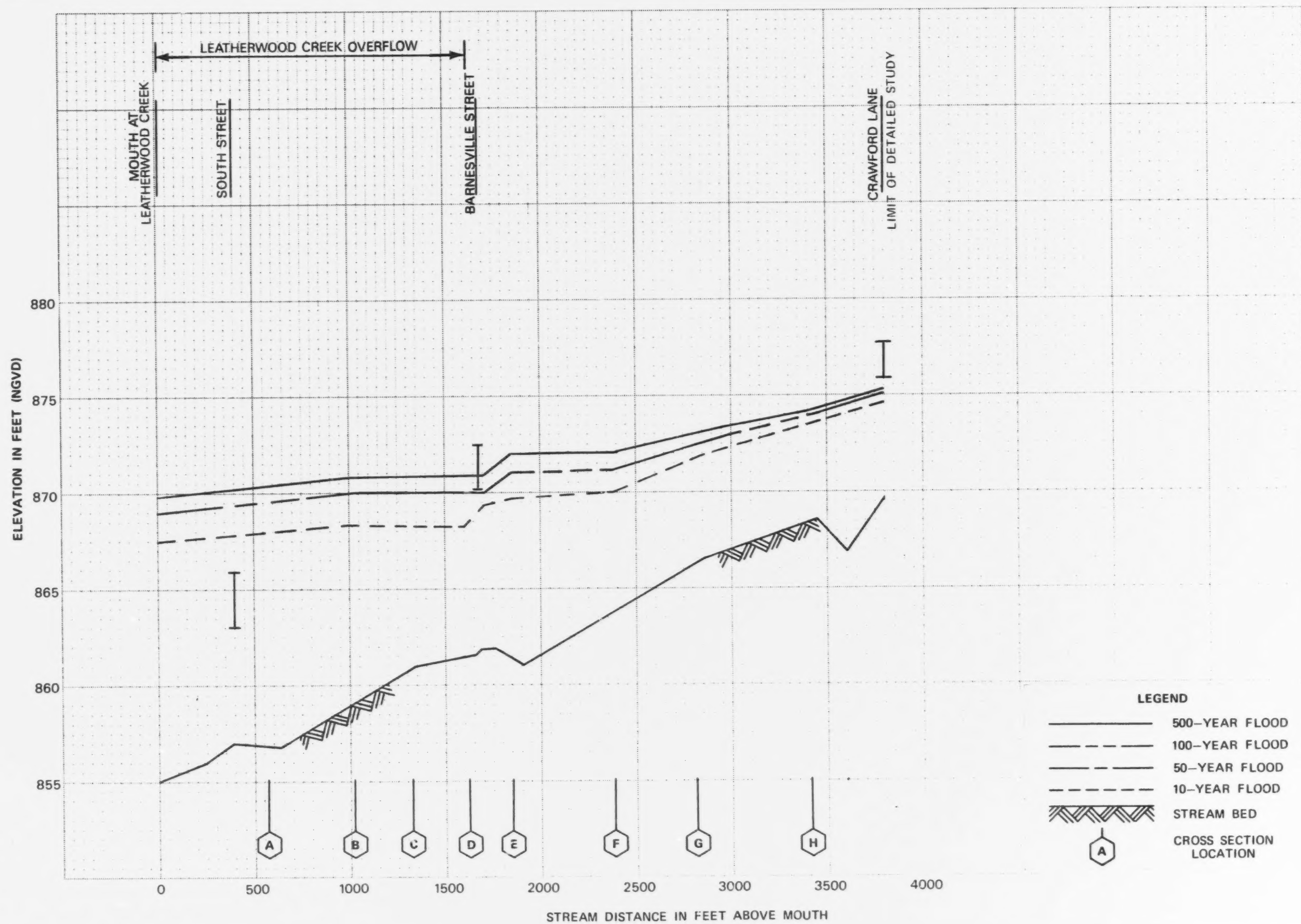
FLOOD PROFILES

LEATHERWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

09P

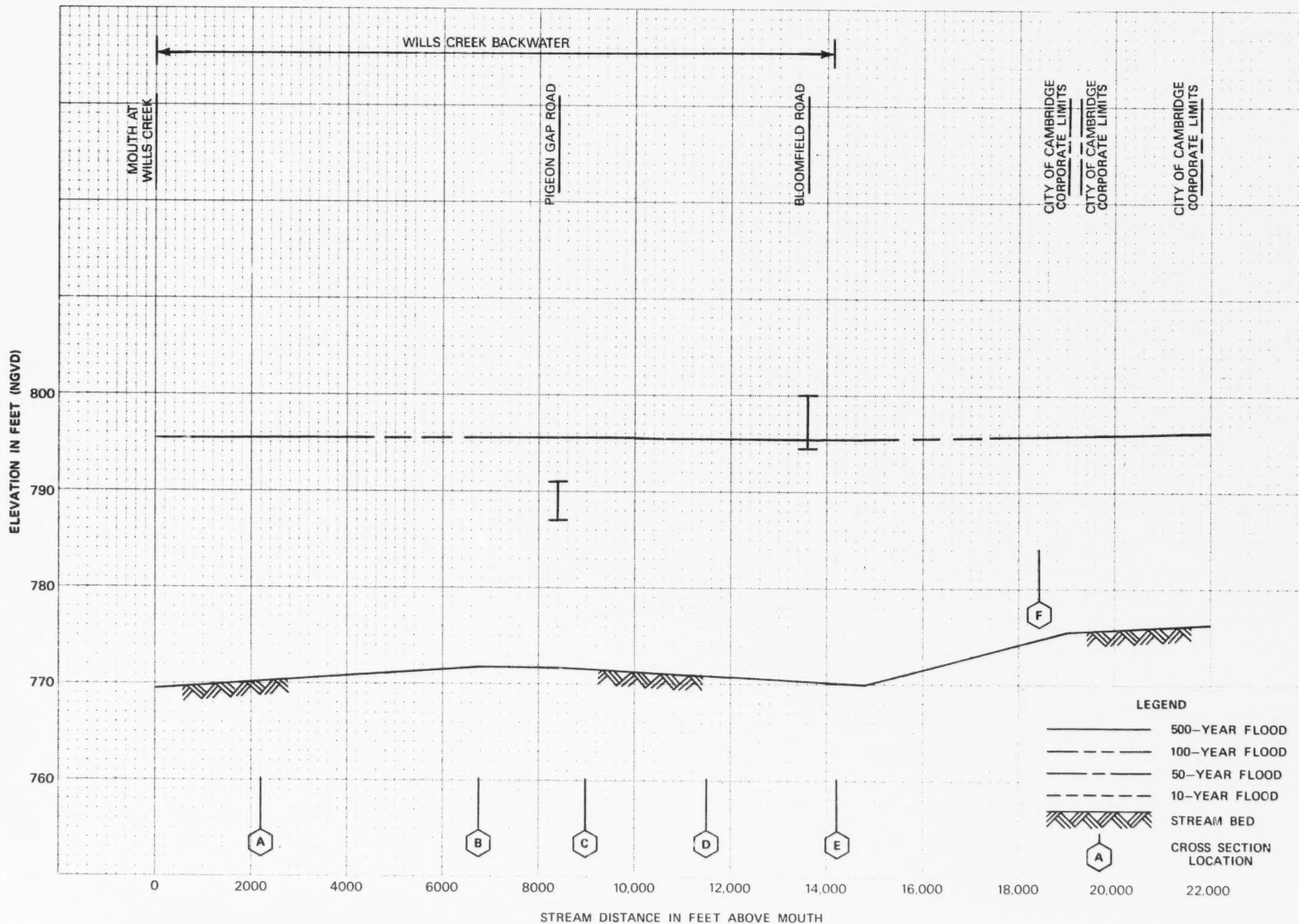


FLOOD PROFILES

SMITH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS



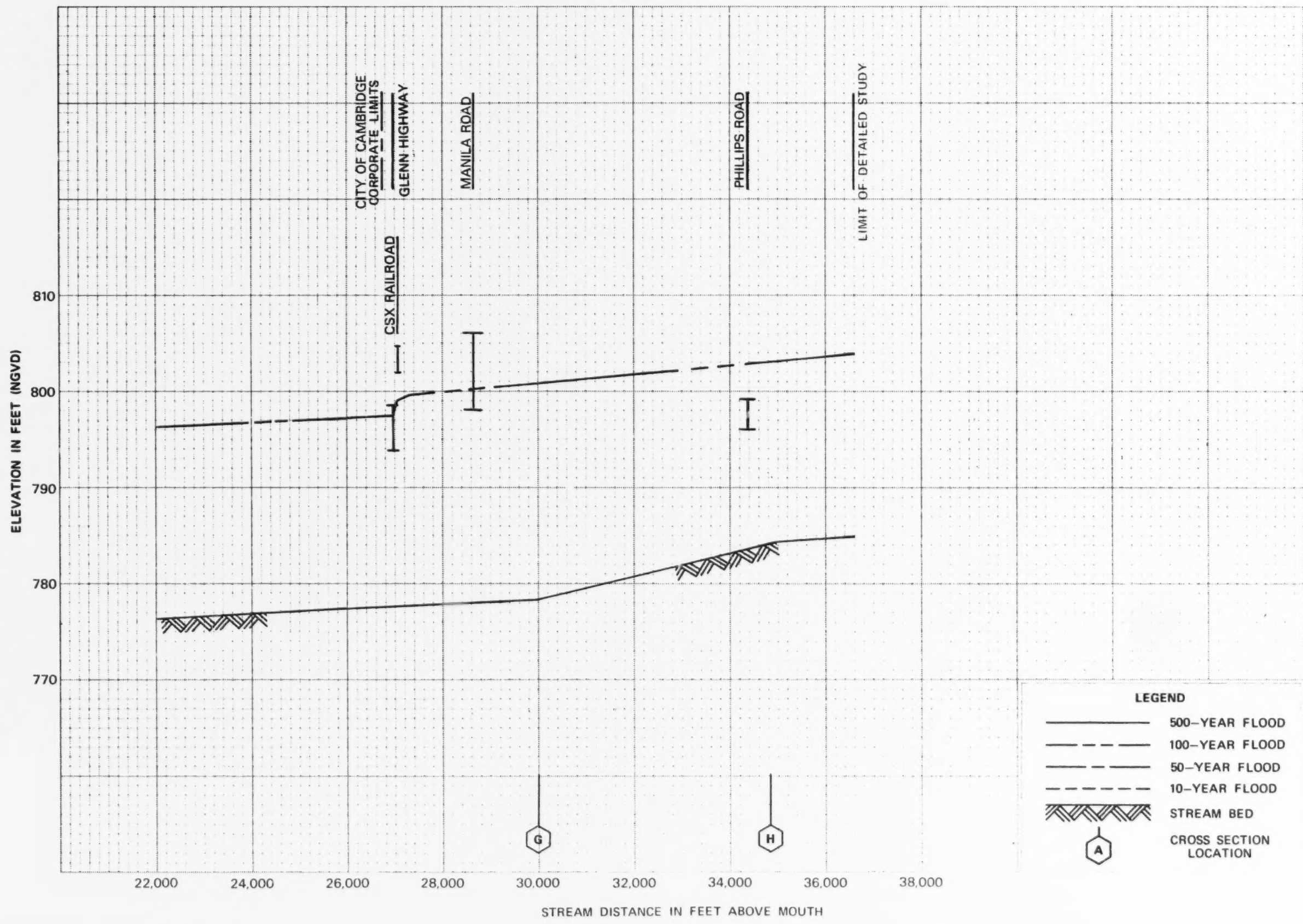
FLOOD PROFILES

CROOKED CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

38



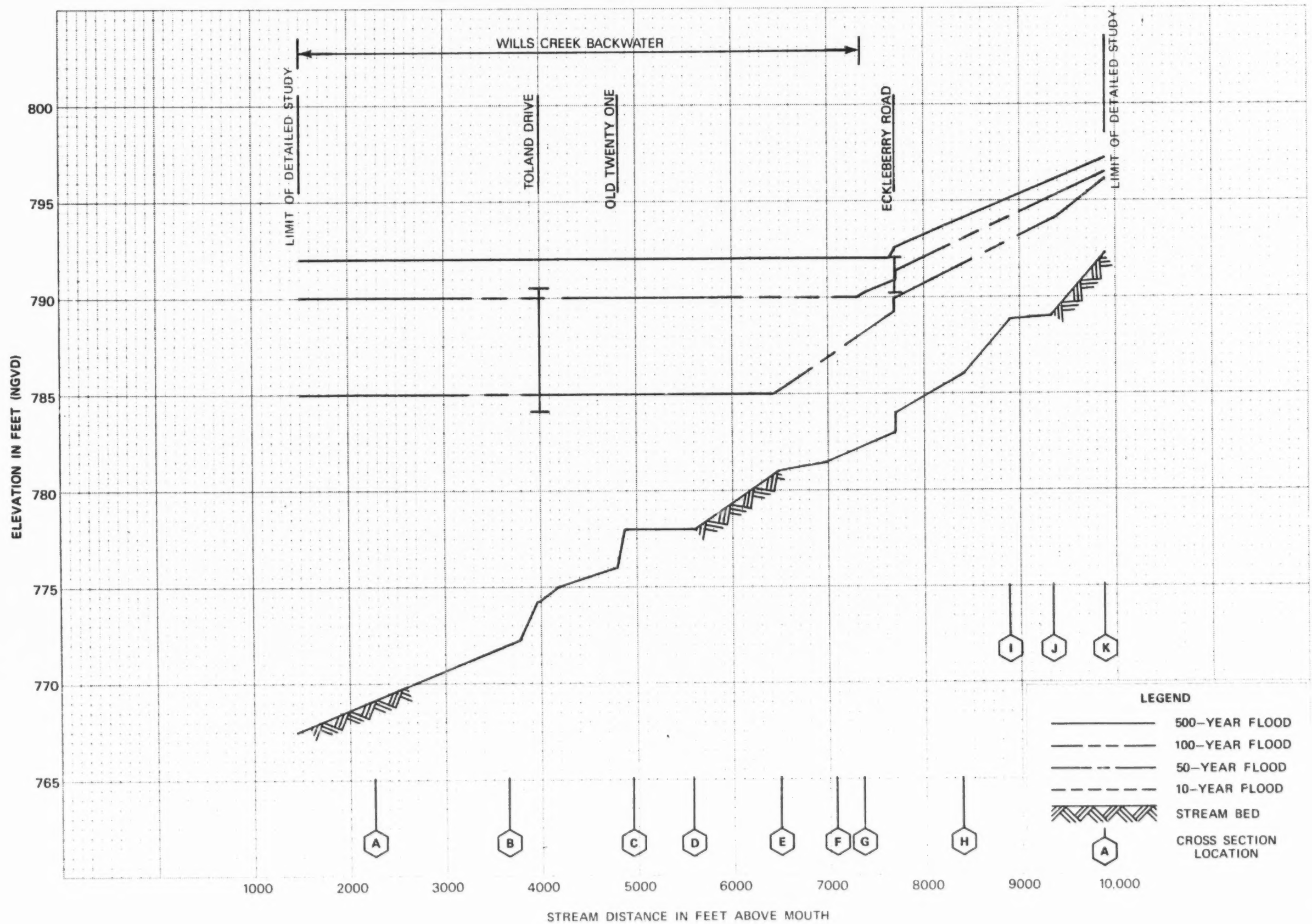
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CROOKED CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

39



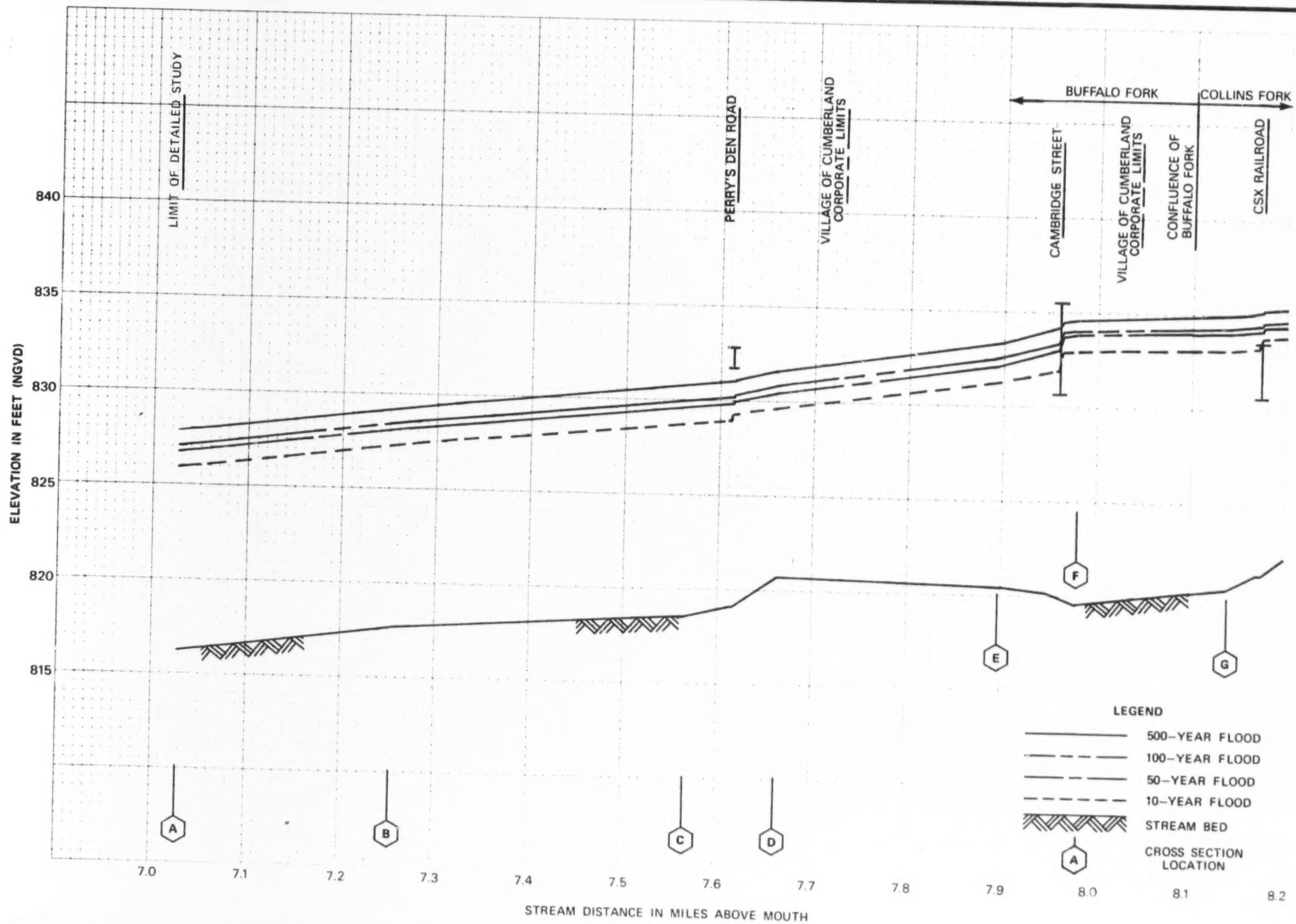
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HOSPITAL TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH

AND INCORPORATED AREAS

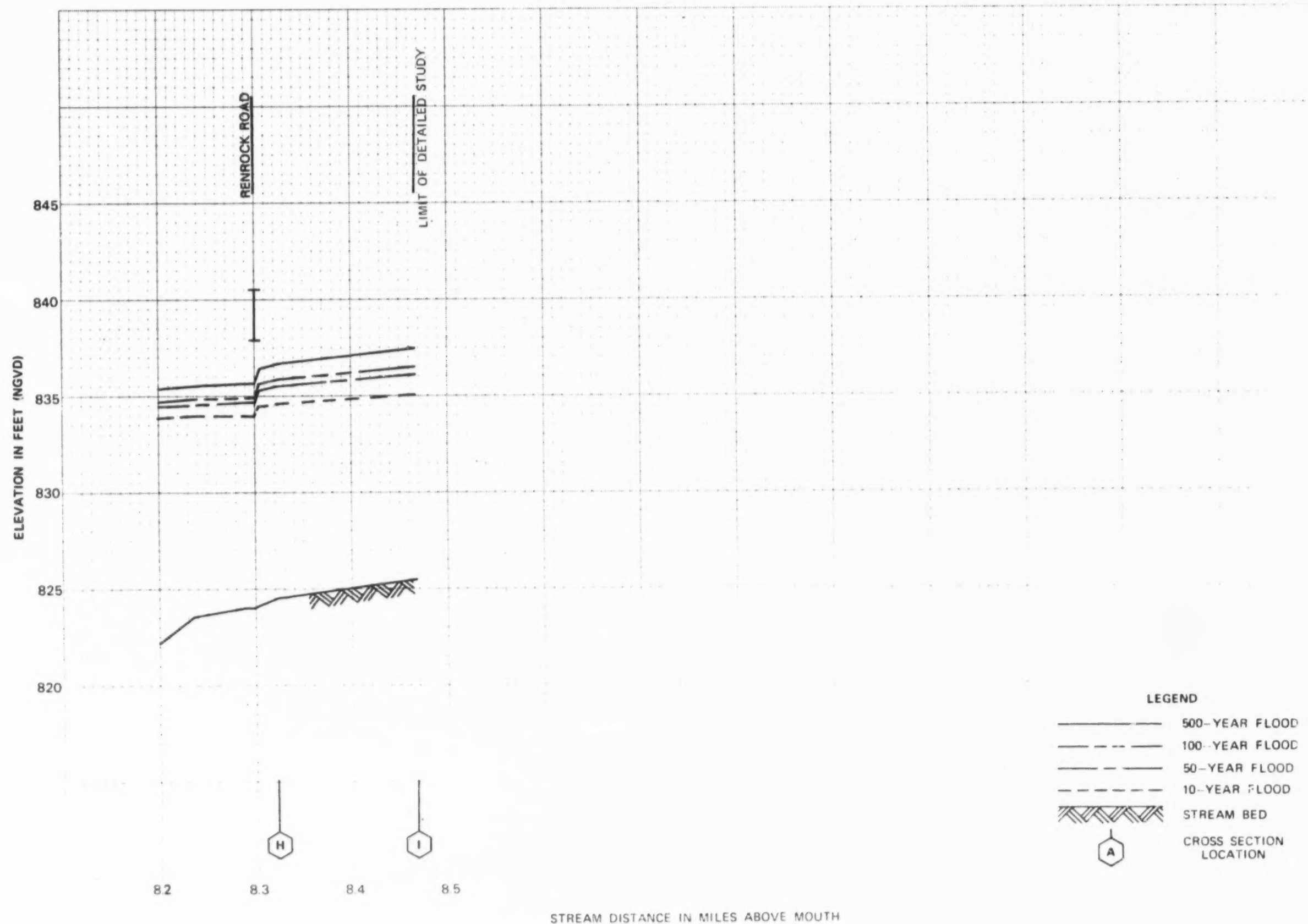


FLOOD PROFILES

BUFFALO FORK—COLLINS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS



FLOOD PROFILES

COLLINS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GUERNSEY COUNTY, OH
AND INCORPORATED AREAS

15P